GLITNE

Improved building design by joint calculating building costs and environmental costs?

Kristin Holthe
SINTEF Building and Infrastructure
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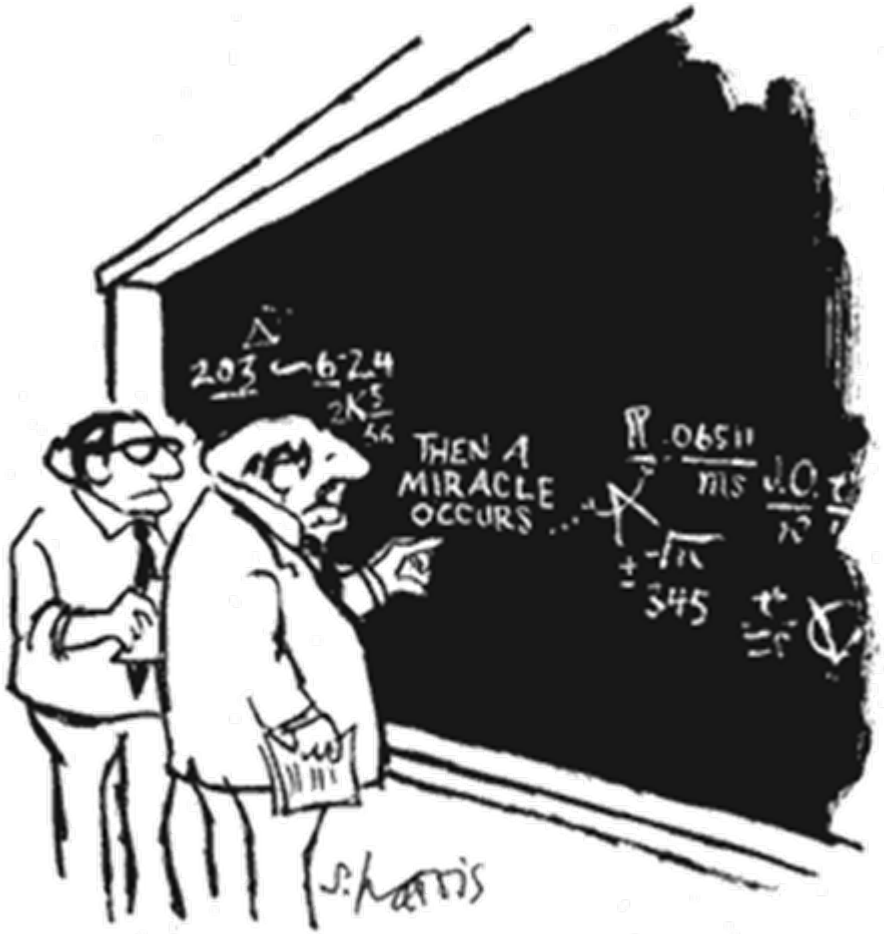
Photo: Kristin Holthe

Why document environmental qualities?



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Calculating environmental qualities in buildings today – what's the problem?

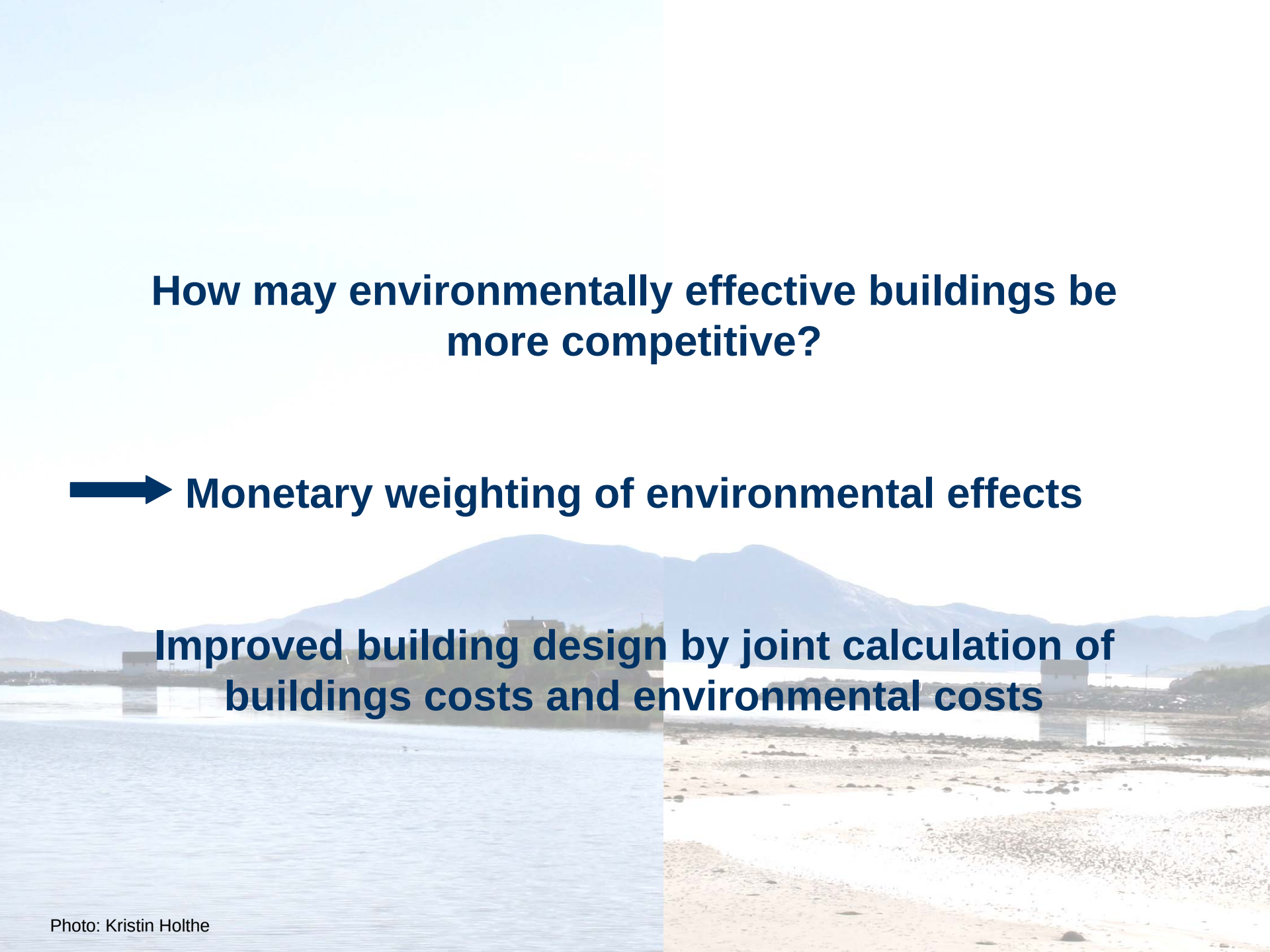
- Lack of databases with satisfactory environmental input data on materials, building products and elements
  - A lot of data is needed in order to assess environmental qualities in alternative design solutions
  - Require collecting data for design options (generic or specific)
  - Existing data on buildings products are not "available" (only available for manufacturer itself, format not available for import in assessment tools)
- Performance of Life Cycle Assessments (LCA)
  - Assessing environmental qualities taking the whole life cycle of a building into account
  - With poor/insufficient data quality - the result of a LCA significant reduced
  - Practical problems; time needed to perform an LCA, lack of agreed methods for the final assessment steps
  - Tools suited for a specific need? Addressing the right decision maker?
  - Not integrated with existing processes, existing tools

Photo: Kristin Holthe

How may environmentally effective buildings be more competitive?

→ **Monetary weighting of environmental effects**

Improved building design by joint calculation of buildings costs and environmental costs



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The GLITNE project

”Putting a price on green”

Who

Snøhetta architects (owner)
15 industry partners
SINTEF (project management)

What

National R&D project 2006-2009
Funding: The Norwegian Research Council

Illustration: Raymond Nilsson (SINTEF Media)

Main objectives

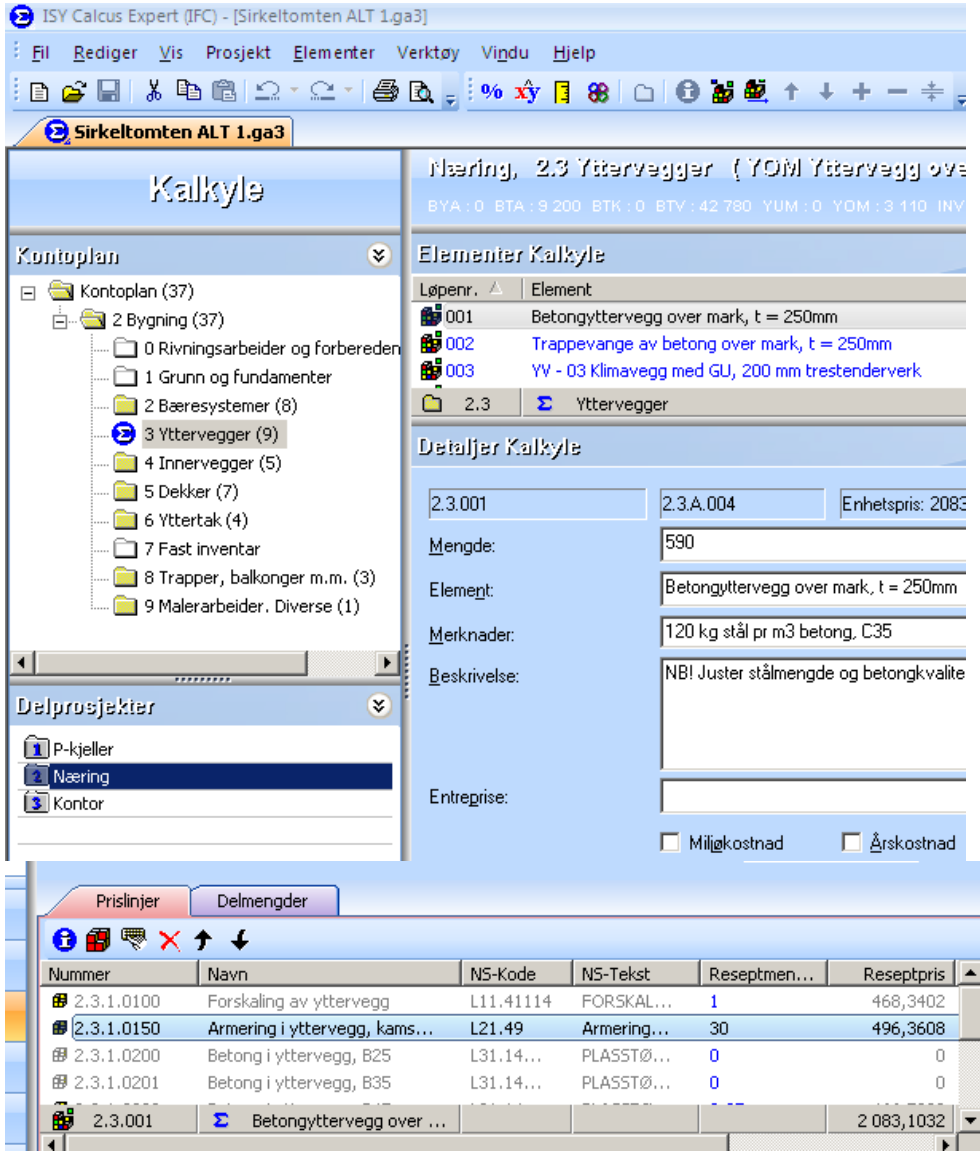
- Produce a method and a tool to show the environmental consequences of a building, for the user, government and business
- Identify how the partners in the project may use the method in environmental product development and therein innovative solutions
- Suggest a model for extended producer responsibility that will benefit the construction / building industry

Criteria for the method and tool

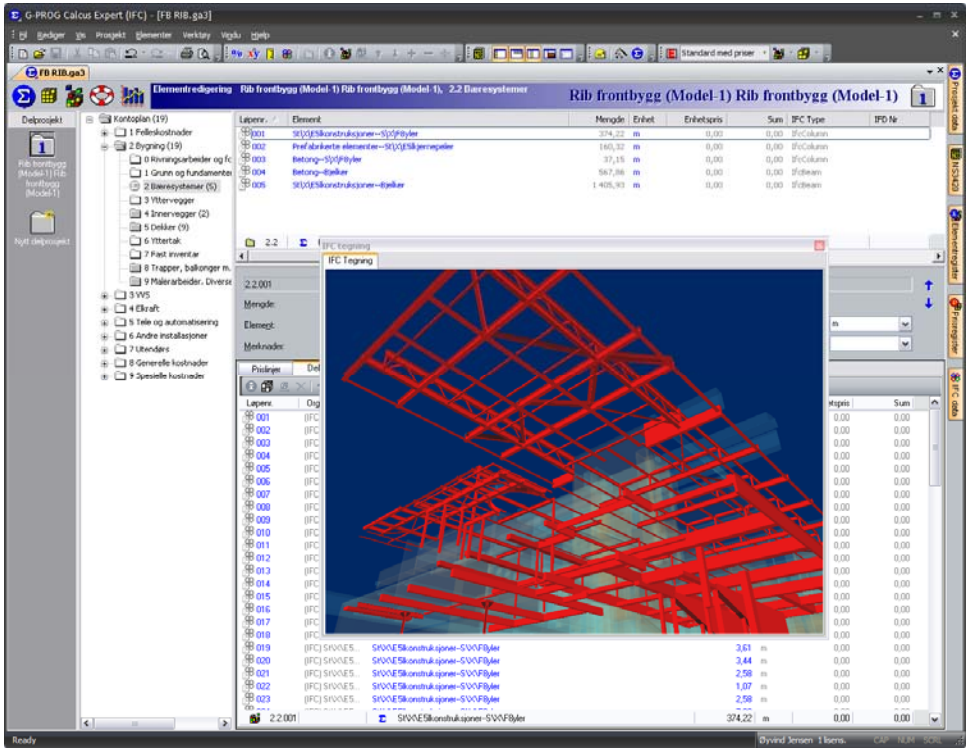
- Survey and input from the industry partners
- Method
  - Monetary based principle for weighting of environmental effects (”put a price on green”)
  - Whole life cycle of the building into account
  - Use LCA-based input data
- Tool
  - Manage to identify the environmental consequence in the early design phase
  - Suited for the needs of the different actors; architect, contractor, consultants etc. and the building process
  - Show environmental effect of different design alternatives
  - Communicate with a BIM open formats (IFC) for interoperability

Tool Calcus

- Integrate the GLITNE method in an existing tool for calculating building costs
- Typical users: e.g. architetcs, engineers, contractors, owners
- “Living” building cost model from idea > schematic design > early design > detail design
- Key quantity data from a building element database (1.500 predefined elements)
- 43 predefined model building projects
- Identify drivers for building costs



BIM calculation (IFC format)



Import of CAD model

- Calcus will recognize name/type number for an automatic match to the elements in Calcus
- Ore: Drag and drop (poorly prepared BIM)

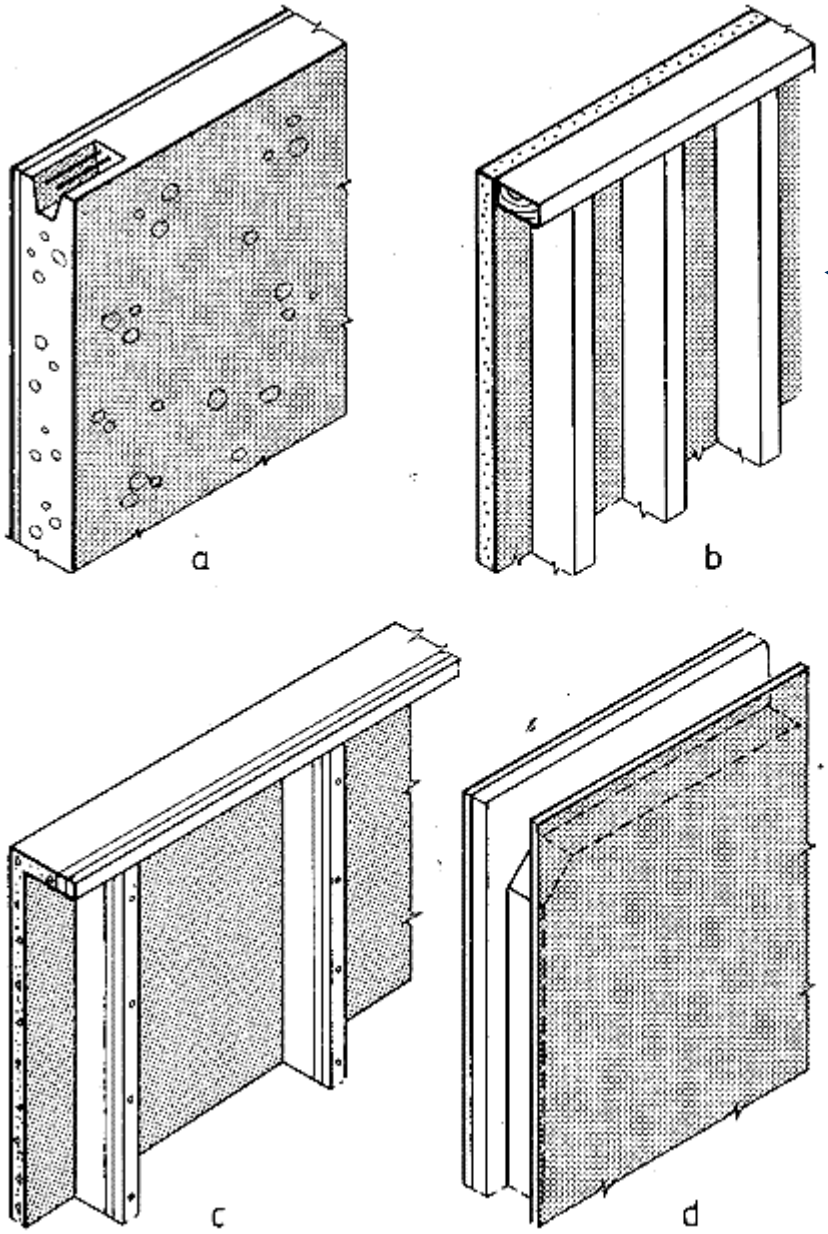
Beta version (soon to be released)

- GHG emissions (organized the “same way” as building costs)

Pictures based on Norconsult

Method - environmental costs

- Three prioritized environmental effects
  1. Climate change (greenhouse gases)
  2. Human and environmental toxicity (e.g. connected to the use of chemicals)
  3. Waste to disposal
- Method established for economic valuation (NOK)
- Goal: to cover whole life cycle of the building
  - Whole life cycle environmental data from (Environ. Product Decl. –EPDs)
  - Energy demand in the building's operational phase
- Huge challenge: LCA-based environmental input data



What's in CALCUS

Building costs (NOK) - exists

Enviromental costs (NOK)

1) Climate data/cost – data exists
2) Toxicty data/cost – under dev.
3) Waste data/cost – under dev.

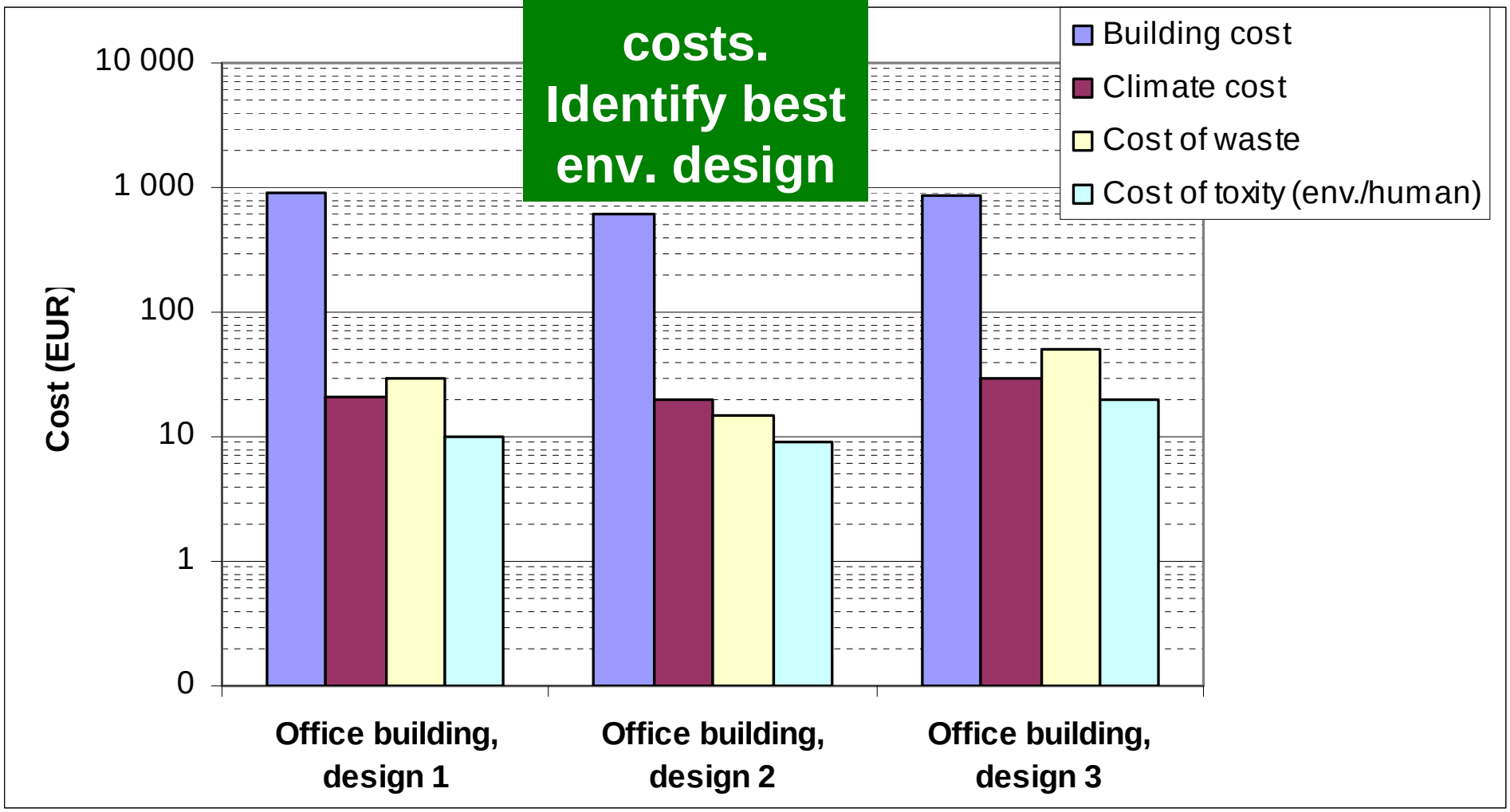
Environmental data connected to specific cases are collected

Operational energy not included yet

Cases in GLITNE

- Office no. 1
  - Interior rehabilitation (2005)
  - Completed
- Office no. 2
  - Office area, parking basement
  - Completed (2003)
- Office no. 3
  - Under construction
  - Parking, offices and public shopping areas.
- Different alternatives of the three office buildings where calculated by using predefined elements and model buildings in the Calcus tool

Lowest total costs. Identify best env. design



Improved building design?

(So far so good. And plenty of further work…)

- Until now:
  - some data already integrated in CALCUS (building costs, GHG emissions)
  - Integrate actual costs for waste disposal
  - Integrate some data on substances contributing to human and environmental toxicity (connected to cases)
- The ideal – connect EPD databases to CALCUS + GLITNE tool
- Testing of the tool
  - Identify total environmental costs for the cases, different design alt.
  - How will changes in Calcus affect architectural design (CAD tools), energy demand (energy simulation tools) – interoperability, use of BIM
  - Observe “real life use”

How do this contribute to IDS?

people, process, technology

- Reuse of data (same objects carrying data about building costs, environmental qualities/costs)
- Interoperability (BIM, open formats)
- Forces a team of experts working together in integrated processes, from idea, to early and detailed design
- Implementing environmental costs in an already widely used tool- more likely that different environmental design will be part of decisions
- Increased decision support in the design process for the actors involved

- Hopefully: time savings, cost savings, reduced environmental load ☺

Thank you for your attention!

kristin.holthe@sintef.no

www.sintef.no/byggforsk